

# PATENT ABSTRACTS OF JAPAN

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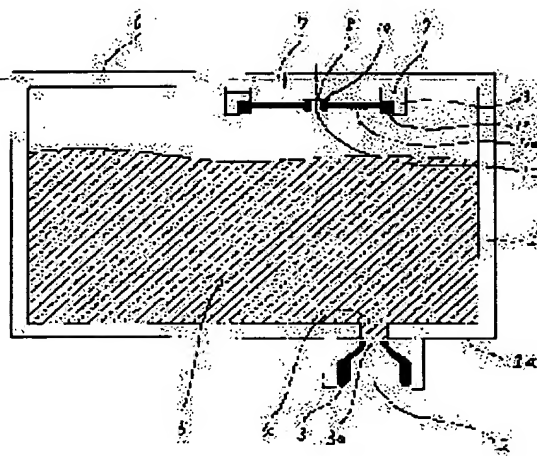
(72)Inventor : SAKAI YASUTO

## (54) INK CARTRIDGE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To stably and surely supply ink contained in a vessel to a recording head in an ink cartridge not using a porous material.

**SOLUTION:** This ink cartridge comprises the vessel 1 containing the ink, an ink supply hole 2 for supplying the ink to an external section and a ventilating hole section for allowing the inner section of the vessel to communicate with the open air and a diaphragm valve 11 is provided at the ventilating hole section.



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(71)出願人 000002369

セイコーエプソン株式会社

東京都新宿区西新宿2丁目4番1号

(72)発明者 坂井 康人

長野県諏訪市大和3丁目3番5号 セイコ

ーエプソン株式会社内

(74)代理人 100095728

弁理士 上柳 雅登 (外1名)

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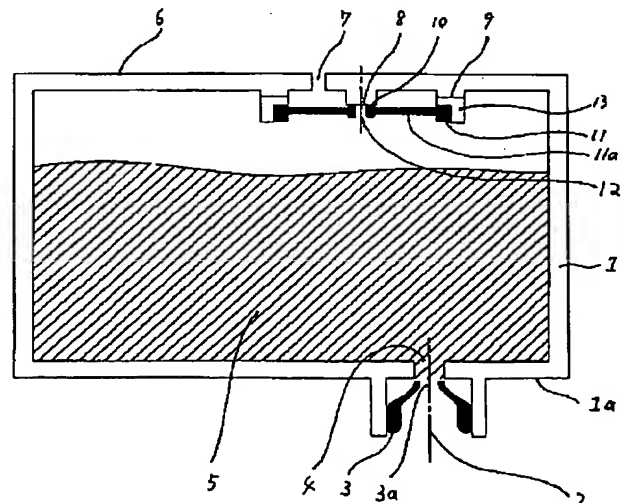
KC01 KC17 KC27

(54)【発明の名称】 インクカートリッジ

(57)【要約】

【課題】 多孔質体を使用しないインクカートリッジにおいて、容器内部に収容されたインクを安定かつ確実に記録ヘッドに供給すること。

【解決手段】 インクが収容された容器1と、外部にインクを供給するインク供給孔2と、容器内部と大気とを連通する通孔部を備え、この通気部に膜弁11を設けた。



## 【特許請求の範囲】

【請求項1】 インクが収容された容器と、外部にインクを供給するインク供給孔と、容器内部と大気とを連通する通孔部を備え、この通気部に膜弁を設けたインクカートリッジ。

【請求項2】 上記膜弁は、インクに対して耐久性を備えた弾性材料からなることを特徴とする請求項1のインクカートリッジ。

【請求項3】 前記弾性材料はゴムまたは高分子エラストマーである請求項2記載のインクカートリッジ。

【請求項4】 前記膜弁に形成された通孔をカートリッジシール部に押圧する押圧手段を設けた請求項1のインクカートリッジ。

【請求項5】 前記押圧手段が、コイルスプリングである請求項1のインクカートリッジ。

【請求項6】 前記押圧手段が、通孔が形成された板バネであることを特徴とする請求項1記載のインクカートリッジ。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、インクジェット式記録ヘッドを搭載するキャリッジに装着するのに適したインクカートリッジに関する。

## 【0002】

【従来の技術】インクジェットプリンタは、共通のインク室とノズル開口とに連通する圧力発生室に圧力を付加してノズル開口からインク滴を吐出させるインクジェット式記録ヘッドと、記録ヘッドにインクを供給するインクカートリッジをキャリッジに搭載し、キャリッジを往復動させながら印刷データに一致させてインク滴を記録用紙に吐出するように構成されている。

【0003】ところで記録ヘッドのノズル開口はインクカートリッジのインク液面よりも低い箇所に位置しているため、ノズル開口には水頭圧が作用するため、通常インクカートリッジ内に多孔質体を収容し、多孔質体による表面張力によりインクカートリッジの圧力がノズル開口よりも若干低くなるように構成して、ノズル開口からインクの滲み出しを防止するような対策が取られている。

【0004】しかしながら、インクの消費が進んで多孔質体に吸収されているインクの量が少なくなると、多孔質体の表面張力が大きくなって記録ヘッドへのインクの供給が滞りやすくなり、カートリッジ内のインクを完全に消費できないという問題がある。また、多孔質体の実質的な体積の分だけ、カートリッジに収容できるインクが少なくなるために、インクカートリッジが大型化するという問題がある。

【0005】このような問題を解決するために、例えば特開平7-68782号公報に示されたように、インクカートリッジ上部の大気開放部にはインクジェットブ

ンタ本体装着時に開状態となる弁構造が設けられ、また、インク供給部にはインク量によって体積の変化するインク保持体を利用した弁構造が設けられたインクジェット記録ヘッド用のインクカートリッジが提案されている。

## 【0006】

【発明が解決しようとする課題】これによれば、カートリッジ内に多孔質体を収容する必要がなくなるため、インクタンクの実質的インク収容量を大きくすることが可能となるが、大量のインク供給が要求された場合にインク保持体の体積変化が追いつかず、必要なインク量をインクジェット式記録ヘッドに供給できず印字品質の低下を招く可能性があるという問題がある。

【0007】一方では、インクジェットプリンタに装着時には大気開放部の弁構造は常に開状態になるために、インクカートリッジを装着したままインクジェットプリンタに姿勢変化を与えた時に、インクカートリッジからインクが流出し、ユーザーの手や衣服を汚染する問題もある。

【0008】さらには、一つのインクカートリッジに二つの弁構造を設けてあるために、インクカートリッジとしては複雑な機構を持つものとなり、部品点数も増加するために、組み立て性の低下やコストの上昇が生じるという問題がある。

【0009】本発明はこのような問題に鑑みてなされたものであって、その目的とするところは、インクカートリッジ内の利用効率を高め、インクジェットプリンタに装着時に姿勢の変化によるインク流出が起こらない、比較的単純な構造を持ったインクカートリッジを提供することである。

## 【0010】

【課題を解決するための手段】このような問題を解決するために本発明においては、一定以下の負圧により開弁する膜弁をインクカートリッジの大気通気部に設けたことを特徴とするものである。

## 【0011】

【作用】膜弁は、通常状態では閉状態であり、記録ヘッドからのインク吐出によってインクが消費されインク量が減少し、インクカートリッジ内部が一定の負圧以下になった時に膜弁が大気圧とインクカートリッジ内部の圧力との差圧を受けて開状態となりインクカートリッジ内部に大気を取り込み負圧がなくなった時に再び閉状態になる。膜弁は通常状態では閉状態であるために、インクカートリッジ内は密閉空間となり、ヘッドノズルからのインクの滲み出しが防止され、また、インクジェットプリンタ本体の姿勢変化による大気開放孔からのインク流出も防止される。

## 【0012】

【発明の実施の形態】以下に本発明の詳細を図示した実施例に基づいて説明する。

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【0013】図1は本発明の一実施例を示すものである。図中符号1はインクカートリッジ本体を構成する容器で、容器の底面1aには容器内のインクが排出されるインク通孔4と、記録ヘッドのインク供給針が挿入されるインク供給孔2とが形成されている。インク供給孔2には図示しない記録ヘッドと連通するインク供給針が挿入された時に、インク供給孔2とインク供給針の間でシールが取れるように、インクに対して耐久性を備えたゴムや高分子エラストマー等の弾性材料からなるシール部材3が挿入されている。記録ヘッドのインク供給針がインク供給孔2に挿入された時に、インク供給針の外周はシール部材3の通孔3aと密着しシールされる。

【0014】インクカートリッジ上面6には大気開放孔7が設けられている。

【0015】符号11はインクに対して耐久性を備えたゴムや高分子エラストマー等の弾性材料からなる膜弁である。膜弁11は膜弁支持部材13と密着しており、その隙間はシールされている。また、膜弁支持部材13はインクカートリッジ内部の接合部9へ振動溶着あるいは超音波溶着等により気密に接合されている。

【0016】膜弁支持部材13はインクカートリッジ上方向へオフセットされて取り付けられており、それによって膜弁11には膜反力が発生し、膜弁シール部10はインクカートリッジの大気シール部8に密着して膜弁11は閉状態となる。本実施例においては、膜弁シール部10はインクカートリッジの大気シール部8に密着しやすくなるように膜部11aから凸になるように形成されている。

【0017】符号5はインクを示しており、液体状態のまま容器1の内部に収納されている。

【0018】膜弁11の中心部に設けられている通孔12は、図2に示すように膜弁11が開状態になった時に、大気開放孔7と連通してインクカートリッジ内部へ空気を取り込むための流路となる。

【0019】図3は本発明の他の実施例を示すものであって、本実施例においては膜弁11のシール部10をコイルバネ21によって大気シール部8に押し付けている。膜弁シール部10の裏面には通孔12の周囲にわたる凸部11bが形成されており、そこにコイルバネ21の一端が挿入されている。膜弁支持部材13の外周部にはコイルバネ支持部材22が圧入などの方法で装着されている。コイルバネ支持部材22の中心部にはコイルバネ21の他端が挿入されるように凹部22aが設けられており、凹部22aの中心部には通孔22bが設けられている。通孔22bは、膜弁11が開状態の時に大気開放孔7および膜弁通孔12と連通する。

【0020】コイルバネ21の寸法およびコイルバネ支持部材22の寸法はコイルバネ21が膜弁凸部11bを適当な圧力で押さえつけるように設計される。

【0021】図4は本発明の他の実施例を示すものであ

って、本実施例においては、膜弁11のシール部10を板バネ31によって、大気シール部8に押し付けている。膜弁支持部材13の外周部に板バネ支持部材32が装着され板バネ支持部材32には板バネ31が装着される。板バネ31の中心部には通孔31aが設けられている。通孔31aは、膜弁11が開状態の時に大気開放孔7および膜弁通孔12と連通する。膜弁シール部10の裏面には、板バネ31が膜弁11の中央部を押すために通孔12の周囲にわたる凸部11bが形成されている。板バネ31の寸法および板バネ支持部材の寸法は板バネ31が膜弁凸部11bを適当な圧力で押さえつけるように設計される。

【0022】ところで、インクジェットプリンタ用インクカートリッジは、インクカートリッジ内のインク物性の変化を抑えるために真空バックされた状態で流通することが一般的であるが、真空バックによりインクカートリッジ外部が負圧になるために、インクカートリッジ内部に収納されているインクが圧力によって外部に漏れ出しやすいという問題がある。本発明のインクカートリッジにおいては真空バックによってインクカートリッジの外部が負圧になった場合に大気開放部の膜弁は閉状態になる方向に圧力が働くためにインクがインクカートリッジの外部に漏れ出しにくいという利点がある。

【0023】

【発明の効果】以上説明したような本発明においては、一定以下の負圧により開弁して大気に連通する膜弁をインクカートリッジ上面に備える構造としたために、記録ヘッドからのインク吐出によってインクが消費されインク量が減少し、インクカートリッジ内部が一定の負圧以下になった時に膜弁が大気圧とインクカートリッジ内部の圧力との差圧を受けて開状態となり、必要量だけインクを記録ヘッドに供給することが可能となる。

【0024】また膜弁は通常状態では閉状態であるために、インクカートリッジ内は密閉空間となり、ヘッドノズルからのインクの滲み出しが防止され、さらにインクジェットプリンタ本体の姿勢変化による大気開放孔からのインク流出も防止される。

【図面の簡単な説明】

【図1】本発明の一実施例の全体を示す断面図である。

【図2】図1の実施例における膜弁の開状態を示した図である。

【図3】本発明の他の実施例の膜弁部断面図である。

【図4】本発明の他の実施例の膜弁部断面図である。

【符号の説明】

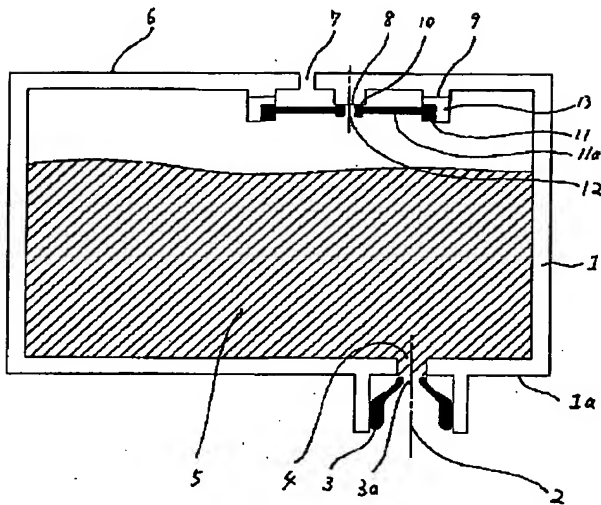
- 1 容器
- 1a 容器の底面
- 2 インク供給孔
- 3 シール部材
- 4 インク通孔
- 5 インク

- 5  
6 インクカートリッジ上面  
7 大気開放孔  
8 インクカートリッジ大気シール部  
9 接合部  
10 膜弁シール部  
11 膜弁  
11a 膜部  
11b 凸部  
12 膜弁通孔

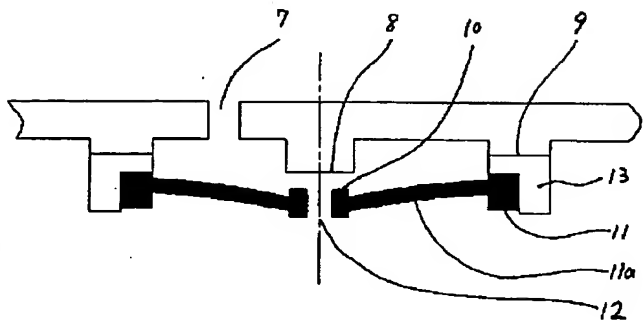
- \* 13 膜弁支持部材  
21 コイルバネ  
22 コイルバネ支持部材  
22a コイルバネ支持部材凹部  
22b コイルバネ支持部材通孔  
31 板バネ  
31a 板バネ通孔  
32 板バネ支持部材

\*

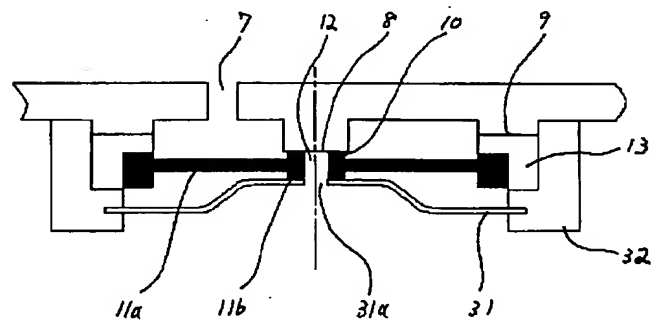
【図1】



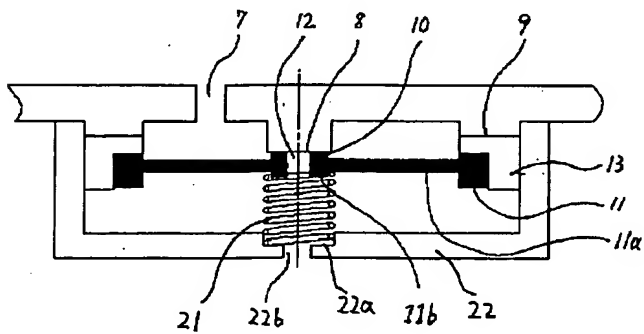
【図2】



【図4】



【図3】



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## CLAIMS

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[Claim(s)]

[Claim 1] The ink cartridge which was equipped with the through-hole section which opens for free passage the container with which ink was held, the ink feed holes which supply ink outside, and the interior of a container and atmospheric air, and prepared the film valve in this aeration section.

[Claim 2] The above-mentioned film valve is the ink cartridge of claim 1 characterized by consisting of a spring material equipped with endurance to ink.

[Claim 3] Said spring material is an ink cartridge according to claim 2 which is rubber or a giant-molecule elastomer.

[Claim 4] The ink cartridge of claim 1 which established a press means to press the through-hole formed in said film valve in the cartridge seal section.

[Claim 5] The ink cartridge of claim 1 said whose press means is a coil spring.

[Claim 6] The ink cartridge according to claim 1 characterized by said press means being the flat spring in which the through-hole was formed.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink cartridge suitable for equipping the carriage which carries an ink jet type recording head.

[0002]

[Description of the Prior Art] An ink jet printer carries at carriage the ink cartridge which supplies ink in the ink jet type recording head which a pressure is added [ recording head ] to the pressure generating room which is open for free passage to a common ink room and a common nozzle orifice, and makes an ink droplet breathe out from a nozzle orifice, and a recording head, and making carriage reciprocate, it is constituted so that it may be made in agreement with print data and the regurgitation of the ink droplet may be carried out to a record form.

[0003] By the way, since the nozzle orifice of a recording head is located in a part lower than the liquid ink side of an ink cartridge, in order that a head may act on a nozzle orifice, a porous body is usually held in an ink cartridge, and it constitutes so that the pressure of an ink cartridge may become low a little rather than a nozzle orifice with the surface tension by the porous body, and measures which ink oozes from a nozzle orifice and prevent \*\* are taken.

[0004] However, when the amount of the ink which consumption of ink progresses and is absorbed by the porous body decreases, the surface tension of a porous body becomes large, supply of the ink to a recording head becomes easy to be overdue, and there is a problem that the ink in a cartridge cannot be consumed completely. Moreover, since the ink of the part of the substantial volume of a porous body which can be held in a cartridge decreases, there is a problem that an ink cartridge is enlarged.

[0005] As it was shown in JP,7-68782,A in order to solve such a problem for example, the ink

cartridge for ink jet recording heads in which the valve structure using the ink supporter from which the valve structure which will be in an open condition at the time of body wearing of an ink jet printer is prepared in the atmospheric-air disconnection section of the ink cartridge upper part, and the volume changes with the amounts of ink to an ink feed zone was prepared is proposed.

[0006]

[Problem(s) to be Solved by the Invention] According to this, since it becomes unnecessary to hold a porous body in a cartridge, it becomes possible to enlarge substantial ink capacity of an ink tank, but when a lot of ink supply is required, the volume change of an ink supporter does not fulfill demand, but the required amount of ink cannot be supplied to an ink jet type recording head, but there is a problem that deterioration of a quality of printed character may be caused.

[0007] On the other hand, since the valve structure of the atmospheric-air disconnection section will always be in an open condition to an ink jet printer at the time of wearing, when posture change is given to an ink jet printer, equipped with an ink cartridge, ink flows out of an ink cartridge and there is also a problem which pollutes a user's hand and clothes.

[0008] Furthermore, since it becomes what has a device complicated as an ink cartridge since two valve structures are prepared in one ink cartridge and components mark also increase, there is a problem that the fall of assembly nature and the rise of cost arise.

[0009] The place which this invention is made in view of such a problem, and is made into the purpose is offering the ink cartridge which raised the use effectiveness in an ink cartridge and had the comparatively simple structure the ink outflow by change of a posture having not taken place at the time of wearing in the ink jet printer.

[0010]

[Means for Solving the Problem] In order to solve such a problem, in this invention, it is characterized by preparing the film valve which opens with the negative pressure below fixed in the atmospheric-air aeration section of an ink cartridge.

[0011]

[Function] In a normal state, a film valve is a closed state, when ink is consumed, the amount of ink decreases and the interior of an ink cartridge becomes below fixed negative pressure by the ink regurgitation from a recording head, a film valve will be in an open condition in response to the differential pressure of an atmospheric pressure and the pressure inside an ink cartridge, and when atmospheric air is incorporated and negative pressure is lost inside an ink cartridge, it will be in a closed state again. Since a film valve is a closed state in a normal state, the inside of an ink cartridge serves as a closed space, the ink from a head nozzle oozes, and \*\* is prevented, and the ink outflow from the atmospheric-air disconnection hole by posture change of the body of an ink jet printer is also prevented.

[0012]

[Embodiment of the Invention] Based on the example illustrating the detail of this invention, it explains below.

[0013] Drawing 1 shows one example of this invention. The sign 1 in drawing is the container which constitutes an ink cartridge body, and the ink through-hole 4 by which the ink in a container is discharged, and the ink feed holes 2 in which the ink supply needle of a recording head is inserted are formed in base 1a of a container. When the recording head which is not illustrated and an ink supply needle open for free passage are inserted in the ink feed holes 2, the seal member 3 which consists of spring materials equipped with endurance to ink, such as rubber and a macromolecule elastomer, is inserted so that a seal can be taken between the ink feed holes



2 and an ink supply needle. When the ink supply needle of a recording head is inserted in the ink feed holes 2, the periphery of an ink supply needle sticks with through-hole 3a of the seal member 3, and a seal is carried out.

[0014] The atmospheric-air disconnection hole 7 is formed in the ink cartridge top face 6.

[0015] A sign 11 is a film valve which consists of spring materials equipped with endurance to ink, such as rubber and a macromolecule elastomer. The film valve 11 is stuck with the film valve supporter material 13, and the seal of the clearance is carried out. Moreover, the film valve supporter material 13 is airtightly joined to the joint 9 inside an ink cartridge by oscillating joining or ultrasonic welding.

[0016] The film valve supporter material 13 will be offset ink cartridge above, and will be attached, by it, film reaction force occurs in a film valve 11, the film valve seal section 10 will be stuck to the atmospheric-air seal section 8 of an ink cartridge, and a film valve 11 will be in a closed state. In this example, the film valve seal section 10 is fabricated so that it may be easy to stick to the atmospheric-air seal section 8 of an ink cartridge, it may become it and it may become a convex from film section 11a.

[0017] The sign 5 shows ink and is contained inside the container 1 with the liquid condition.

[0018] The through-hole 12 prepared in the core of a film valve 11 serves as passage for it being open for free passage with the atmospheric-air disconnection hole 7, and incorporating air inside an ink cartridge, when a film valve 11 changes into an open condition, as shown in drawing 2.

[0019] Drawing 3 shows other examples of this invention, and has forced the seal section 10 of a film valve 11 on the atmospheric-air seal section 8 with the coil spring 21 in this example.

Heights 11b covering the perimeter of a through-hole 12 is formed in the rear face of the film valve seal section 10, and the end of a coil spring 21 is inserted there. The periphery section of the film valve supporter material 13 is equipped with the coil-spring supporter material 22 by approaches, such as press fit. Crevice 22a is prepared in the core of the coil-spring supporter material 22 so that the other end of a coil spring 21 may be inserted, and through-hole 22b is prepared in the core of crevice 22a. Through-hole 22b is open for free passage with the atmospheric-air disconnection hole 7 and the film valve through-hole 12, when a film valve 11 is in an open condition.

[0020] The dimension of a coil spring 21 and the dimension of the coil-spring supporter material 22 are designed so that a coil spring 21 may suppress film valve heights 11b by the suitable pressure.

[0021] Drawing 4 shows other examples of this invention, and has forced the seal section 10 of a film valve 11 on the atmospheric-air seal section 8 by the flat spring 31 in this example. The periphery section of the film valve supporter material 13 is equipped with the flat-spring supporter material 32, and the flat-spring supporter material 32 is equipped with a flat spring 31.

Through-hole 31a is prepared in the core of a flat spring 31. Through-hole 31a is open for free passage with the atmospheric-air disconnection hole 7 and the film valve through-hole 12, when a film valve 11 is in an open condition. In order that a flat spring 31 may push the center section of the film valve 11, heights 11b covering the perimeter of a through-hole 12 is formed in the rear face of the film valve seal section 10. The dimension of a flat spring 31 and the dimension of flat-spring supporter material are designed so that a flat spring 31 may suppress film valve heights 11b by the suitable pressure.

[0022] By the way, in order to suppress change of the ink physical properties in an ink cartridge, as for the ink cartridge for ink jet printers, circulating, where a vacuum packing is carried out is common, but since the ink cartridge exterior becomes negative pressure by the vacuum packing,

there is a problem that the ink contained inside the ink cartridge is easy to begin to leak outside with a pressure. When the exterior of an ink cartridge becomes negative pressure by the vacuum packing in the ink cartridge of this invention, the film valve of the atmospheric-air disconnection section has the advantage that ink is hard to begin to leak to the exterior of an ink cartridge, in order that a pressure may work in the direction which will be in a closed state.

[0023]

[Effect of the Invention] Since it is considered as the structure which equips an ink cartridge top face with the film valve which opens with the negative pressure below fixed and is open for free passage to atmospheric air in this invention which was explained above, Ink is consumed by the ink regurgitation from a recording head, and the amount of ink decreases by it. When the interior of an ink cartridge becomes below fixed negative pressure, a film valve will be in an open condition in response to the differential pressure of an atmospheric pressure and the pressure inside an ink cartridge, and will become possible [ that only an initial complement supplies ink to a recording head ].

[0024] Moreover, since a film valve is a closed state in a normal state, the inside of an ink cartridge serves as a closed space, the ink from a head nozzle oozes, \*\* is prevented, and the ink outflow from the atmospheric-air disconnection hole by posture change of the body of an ink jet printer is also prevented further.

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## TECHNICAL FIELD

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[Field of the Invention] This invention relates to the ink cartridge suitable for equipping the carriage which carries an ink jet type recording head.

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## PRIOR ART

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[Description of the Prior Art] An ink jet printer carries at carriage the ink cartridge which supplies ink in the ink jet type recording head which a pressure is added [ recording head ] to the pressure generating room which is open for free passage to a common ink room and a common nozzle orifice, and makes an ink droplet breathe out from a nozzle orifice, and a recording head, and making carriage reciprocate, it is constituted so that it may be made in agreement with print data and the regurgitation of the ink droplet may be carried out to a record form.

[0003] By the way, since the nozzle orifice of a recording head is located in a part lower than the liquid ink side of an ink cartridge, in order that a head may act on a nozzle orifice, a porous body is usually held in an ink cartridge, and it constitutes so that the pressure of an ink cartridge may become low a little rather than a nozzle orifice with the surface tension by the porous body, and measures which ink oozes from a nozzle orifice and prevent \*\* are taken.

[0004] However, when the amount of the ink which consumption of ink progresses and is absorbed by the porous body decreases, the surface tension of a porous body becomes large, supply of the ink to a recording head becomes easy to be overdue, and there is a problem that the ink in a cartridge cannot be consumed completely. Moreover, since the ink of the part of the substantial volume of a porous body which can be held in a cartridge decreases, there is a problem that an ink cartridge is enlarged.

[0005] As it was shown in JP,7-68782,A in order to solve such a problem for example, the ink

cartridge for ink jet recording heads in which the valve structure using the ink supporter from which the valve structure which will be in an open condition at the time of body wearing of an ink jet printer is prepared in the atmospheric-air disconnection section of the ink cartridge upper part, and the volume changes with the amounts of ink to an ink feed zone was prepared is proposed.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] Since it considered as the structure which equips an ink cartridge top face with the film valve which opens with the negative pressure below fixed and is open for free passage to atmospheric air in this invention which was explained above, When ink is consumed, the amount of ink decreases and the interior of an ink cartridge becomes below fixed negative pressure by the ink regurgitation from a recording head, a film valve will be in an open condition in response to the differential pressure of an atmospheric pressure and the pressure inside an ink cartridge, and will become possible [ that only an initial complement supplies ink to a recording head ].

[0024] Moreover, since a film valve is a closed state in a normal state, the inside of an ink cartridge serves as a closed space, the ink from a head nozzle oozes, \*\* is prevented, and the ink outflow from the atmospheric-air disconnection hole by posture change of the body of an ink jet printer is also prevented further.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] According to this, since it becomes unnecessary to hold a porous body in a cartridge, it becomes possible to enlarge substantial ink capacity of an ink tank, but when a lot of ink supply is required, the volume change of an ink supporter does not fulfill demand, but the required amount of ink cannot be supplied to an ink jet type recording head, but there is a problem that deterioration of a quality of printed character may be caused.

[0007] On the other hand, since the valve structure of the atmospheric-air disconnection section will always be in an open condition to an ink jet printer at the time of wearing, when posture change is given to an ink jet printer, equipped with an ink cartridge, ink flows out of an ink cartridge and there is also a problem which pollutes a user's hand and clothes.

[0008] Furthermore, since it becomes what has a device complicated as an ink cartridge since two valve structures are prepared in one ink cartridge and components mark also increase, there is a problem that the fall of assembly nature and the rise of cost arise.

[0009] The place which this invention is made in view of such a problem, and is made into the purpose is offering the ink cartridge which raised the use effectiveness in an ink cartridge and had the comparatively simple structure the ink outflow by change of a posture having not taken place at the time of wearing in the ink jet printer.

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## MEANS

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[Means for Solving the Problem] In order to solve such a problem, in this invention, it is characterized by preparing the film valve which opens with the negative pressure below fixed in the atmospheric-air aeration section of an ink cartridge.

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## OPERATION

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[Function] In a normal state, a film valve is a closed state, when ink is consumed, the amount of ink decreases and the interior of an ink cartridge becomes below fixed negative pressure by the ink regurgitation from a recording head, a film valve will be in an open condition in response to the differential pressure of an atmospheric pressure and the pressure inside an ink cartridge, and when atmospheric air is incorporated and negative pressure is lost inside an ink cartridge, it will be in a closed state again. Since a film valve is a closed state in a normal state, the inside of an ink cartridge serves as a closed space, the ink from a head nozzle oozes, and \*\* is prevented, and the ink outflow from the atmospheric-air disconnection hole by posture change of the body of an ink jet printer is also prevented.

[0012]

[Embodiment of the Invention] Based on the example illustrating the detail of this invention, it explains below.

[0013] Drawing 1 shows one example of this invention. The sign 1 in drawing is the container which constitutes an ink cartridge body, and the ink through-hole 4 by which the ink in a container is discharged, and the ink feed holes 2 in which the ink supply needle of a recording head is inserted are formed in base 1a of a container. When the recording head which is not illustrated and an ink supply needle open for free passage are inserted in the ink feed holes 2, the seal member 3 which consists of spring materials equipped with endurance to ink, such as rubber and a macromolecule elastomer, is inserted so that a seal can be taken between the ink feed holes 2 and an ink supply needle. When the ink supply needle of a recording head is inserted in the ink feed holes 2, the periphery of an ink supply needle sticks with through-hole 3a of the seal member 3, and a seal is carried out.

[0014] The atmospheric-air disconnection hole 7 is formed in the ink cartridge top face 6.

[0015] A sign 11 is a film valve which consists of spring materials equipped with endurance to ink, such as rubber and a macromolecule elastomer. The film valve 11 is stuck with the film valve supporter material 13, and the seal of the clearance is carried out. Moreover, the film valve supporter material 13 is airtightly joined to the joint 9 inside an ink cartridge by oscillating joining or ultrasonic welding.

[0016] The film valve supporter material 13 will be offset ink cartridge above, and will be attached, by it, film reaction force occurs in a film valve 11, the film valve seal section 10 will be stuck to the atmospheric-air seal section 8 of an ink cartridge, and a film valve 11 will be in a closed state. In this example, the film valve seal section 10 is fabricated so that it may be easy to stick to the atmospheric-air seal section 8 of an ink cartridge, it may become it and it may become a convex from film section 11a.

[0017] The sign 5 shows ink and is contained inside the container 1 with the liquid condition.

[0018] The through-hole 12 prepared in the core of a film valve 11 serves as passage for it being open for free passage with the atmospheric-air disconnection hole 7, and incorporating air inside an ink cartridge, when a film valve 11 changes into an open condition, as shown in drawing 2.

[0019] Drawing 3 shows other examples of this invention, and has forced the seal section 10 of a film valve 11 on the atmospheric-air seal section 8 with the coil spring 21 in this example.

Heights 11b covering the perimeter of a through-hole 12 is formed in the rear face of the film valve seal section 10, and the end of a coil spring 21 is inserted there. The periphery section of the film valve supporter material 13 is equipped with the coil-spring supporter material 22 by

approaches, such as press fit. Crevice 22a is prepared in the core of the coil-spring supporter material 22 so that the other end of a coil spring 21 may be inserted, and through-hole 22b is prepared in the core of crevice 22a. Through-hole 22b is open for free passage with the atmospheric-air disconnection hole 7 and the film valve through-hole 12, when a film valve 11 is in an open condition.

[0020] The dimension of a coil spring 21 and the dimension of the coil-spring supporter material 22 are designed so that a coil spring 21 may suppress film valve heights 11b by the suitable pressure.

[0021] Drawing 4 shows other examples of this invention, and has forced the seal section 10 of a film valve 11 on the atmospheric-air seal section 8 by the flat spring 31 in this example. The periphery section of the film valve supporter material 13 is equipped with the flat-spring supporter material 32, and the flat-spring supporter material 32 is equipped with a flat spring 31. Through-hole 31a is prepared in the core of a flat spring 31. Through-hole 31a is open for free passage with the atmospheric-air disconnection hole 7 and the film valve through-hole 12, when a film valve 11 is in an open condition. In order that a flat spring 31 may push the center section of the film valve 11, heights 11b covering the perimeter of a through-hole 12 is formed in the rear face of the film valve seal section 10. The dimension of a flat spring 31 and the dimension of flat-spring supporter material are designed so that a flat spring 31 may suppress film valve heights 11b by the suitable pressure.

[0022] By the way, in order to suppress change of the ink physical properties in an ink cartridge, as for the ink cartridge for ink jet printers, circulating, where a vacuum packing is carried out is common, but since the ink cartridge exterior becomes negative pressure by the vacuum packing, there is a problem that the ink contained inside the ink cartridge is easy to begin to leak outside with a pressure. When the exterior of an ink cartridge becomes negative pressure by the vacuum packing in the ink cartridge of this invention, the film valve of the atmospheric-air disconnection section has the advantage that ink is hard to begin to leak to the exterior of an ink cartridge, in order that a pressure may work in the direction which will be in a closed state.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the one whole example of this invention.

[Drawing 2] It is drawing having shown the open condition of the film valve in the example of drawing 1.

[Drawing 3] It is the film valve section sectional view of other examples of this invention.

[Drawing 4] It is the film valve section sectional view of other examples of this invention.

[Description of Notations]

1 Container

1a The base of a container

2 Ink Feed Holes

3 Seal Member

4 Ink Through-hole

5 Ink

6 Ink Cartridge Top Face

7 Atmospheric-Air Disconnection Hole

8 Ink Cartridge Atmospheric-Air Seal Section  
9 Joint  
10 Film Valve Seal Section  
11 Film Valve  
11a Film section  
11b Heights  
12 Film Valve Through-hole  
13 Film Valve Supporter Material  
21 Coil Spring  
22 Coil-Spring Supporter Material  
22a Coil-spring supporter material crevice  
22b Coil-spring supporter material through-hole  
31 Flat Spring  
31a Flat-spring through-hole  
32 Flat-Spring Supporter Material